Chapter 1
Introduction

Section 100.0 Flood Proofing and Building Codes

Sec. 100.1 General: Many thousands of structures and potential building sites are located in the flood plains of our Nation and are susceptible to flooding. Flood control projects have partially protected some of these structures and building sites through reduction of the flood threat. However, the residual threat to partially protected sites and the total threat to unprotected sites remain as major problems. Evidence of this is given every year by the millions of words and hundreds of headlines that dramatically describe floods and their resulting damage and loss of life. When floods strike developed areas, whole cities may be disrupted and their productive capacities impaired. Strategic transportation lines are cut. Public service facilities are sapped, homes and crops are destroyed, and soils are eroded. Yet, in spite of this, flood vulnerable lands are the setting for continued urban growth in the United States.

Studies of flood plain use show that some encroachment is undertaken in ignorance of the hazard, that some occurs in anticipation of increased Federal protection, and that some takes place because, by shifting the cost of the hazard to society, it becomes profitable for private owners to do so. Even if full information on the flood hazard were available to all owners or users of flood plain property, there would still be conscious decisions for some reason or another to build in areas that are subject to flooding. In order to escape this dismal cycle of losses, partial protection, further induced development, and more unnecessary losses, old attitudes must be transformed into positive actions.

Primary among these actions is the revision of development policies and the enactment of a regulatory program to encourage and/or restrict the direction of growth or change necessary to achieve flood plain management objectives. Information programs are essential to this revision. They foster the development of more appropriate policies and involve the gathering and dissemination of data on past floods, on estimates of future floods, and information on alternate ways of dealing with flood losses in areas where intensive development has taken place or is anticipated. The latter has led to an expanded approach to flood damage reduction and prevention, recognizing the need to control or regulate the use of lands adjacent to watercourses and the need to provide guidance in the design of flood plain structures through the planned management and development of the flood hazard areas.

Regulation of the use of flood plain lands is a responsibility of State and local governments and can be accomplished by a variety of means, such as establishment of designated floodways and encroachment lines, zoning ordinances, subdivision regulations, and building codes. These land use controls, most often known as "Flood Plain Regulations," do not attempt to reduce or eliminate flooding but instead are intended to guide and regulate flood plain development to lessen the adverse effects of floods. Flood prone communities in the United States participating in the National Flood Insurance Program (NFIP) are required to adopt and enforce such flood plain regulations to qualify for the sale of federally-backed flood insurance to its residents.

Flood proofing standards applied through building codes and regulations to flood plain structures can permit economic development in the lower risk areas by holding flood damages and other adverse effects within acceptable limits. Flood proofing requires adjustments both to structures and to building contents and involves keeping water out as well as reducing the effects of water entry. Such adjustments can be applied by the individual or as part of collective action either when buildings are under construction or during remodeling or expansion of existing structures. They may be permanent or temporary.

Flood proofing, like other methods of adjusting to floods, has its limitations, however. For example, in addition to reducing loss potentials, a main purpose of flood proofing habitable structures is to provide for early return to normalcy after floods have receded rather than for continuity of occupance. Through a false sense of security, occupants may choose to remain during a flood and risk being stranded or losing their lives. Also, unless correctly used, flood proofing can tend to increase uneconomical use of flood plains. If applied to structurally unsound buildings, it can result in more damage than would have occurred without flood proofing. Generally it is applied to individual structures, so unless flood proofing is also applied to means of access, it is only partially effective in an area context. Accordingly, access ways should be passable at least in floods up to the magnitude used in setting flood proofing elevations.

These recommended regulations are intended for direct use or for incorporation into existing building codes which properly enforced should effectively reduce flood damages to buildings and structures located in the flood plain. Compliance should be a mandatory requirement for approval of plans or issuance of permits for construction of all new buildings and structures, and for existing buildings that will be subjected to major alterations, additions, or reconstruction in the defined flood hazard areas.

These recommended regulations neither contain nor are referenced to other regulations pertinent to flood plain management that may be provided by separate statute or involve political decisions relative to land use, zoning, subdivision regulations, occupancy restrictions, creation of flood zones, flood warning, or floodway encroachment. The intent here is to establish the special design and construction provisions that should be required for buildings, structures, and support facilities that are or may be subjected to flooding, relying upon zoning regulations to establish the areas of application. Other aspects of flood plain regulations, such as Flood Plain Zoning and Subdivision Regulations, are treated in "Regulation of Flood Hazard Areas to Reduce Flood Losses", Volumes 1 and 2 (1972), and Volume 3 (1982), Water Resources Council, Washington, D.C.

This publication deals with the treatment of hydrostatic and hydrodynamic forces and waterproofing associated with riverine flooding only. To the extent that coastline structures are subject to these semistatic conditions, these provisions will be applicable to coastal or tidal flooding situations; however, no consideration is given to the special problems of wave impact, corrosion, and erosion associated with coastal flooding. Similarly, the problems of impact from floating debris and velocity introduce dynamic considerations which are not treated in detail and mud slide and high density fluid problems that are prevalent in West Coast communities are omitted entirely.

The design and construction criteria contained herein for riverine flooding conditions should be of substantial benefit to many communities. Future development of more comprehensive coverage including the treatment of special dynamic problems should be implemented where warranted by others more directly involved with the particular flood damage situations.

Sec. 100.2 National Flood Insurance Program: The National Flood Insurance Program (NFIP) was created by Congress in 1968 to provide federally-backed flood insurance coverage that was generally not available from private sector companies, and to promote wise flood plain management practices in the Nation's floodprone areas. One of the goals of this program is to reduce future flood losses by establishing guidelines for protecting existing and new development. The NFIP operates on a mutual agreement with communities which have been identified as flood-prone. Community-wide flood insurance coverage is provides if the community adopts and enforces flood plain management ordinances and regulations which meet or exceed the specific minimum program requirements. The NFIP is administered by the Federal Insurance Administration (FIA) of the Federal Emergency Management Agency (FEMA) under the authority of the National Flood Insurance Act of 1968 and Flood Disaster Protection Act of 1973; U.S.C. 4001-4128.

The NFIP insurance coverage is available only in communities that agree to implement comprehensive flood plain management regulations to reduce the likelihood of future flood damage. This is often done through zoning ordinances that can be more restrictive than those required by the NFIP.

The NFIP is administered in two phases: the Emergency Program and the Regular Program. The function of the Emergency Program is to make flood insurance readily available to property owners in flood prone communities which are identified by the FIA by the issuance of a Flood Hazard Boundary Map (FHBM). This map is a preliminary delineation of Special Flood Hazard Areas within the community with a definite likelihood of inundation. No elevations are shown. Upon entering the Emergency Program, limited amounts of flood insurance become available and the community is required to apply minimal flood plain management regulations based on the FHBM, and is encouraged to reasonably use any additional data that may be available from other sources.

A community generally enters the Regular Program after the completion of a detailed technical study which determines elevations of floods of varying intensity, including the base flood, areas inundated by the various magnitudes of flooding, and floodway boundaries. This information is presented on a Flood Insurance Rate Map (FIRM) and Flood Boundary and Floodway Map (FBFM). A FIRM generally shows flood prone areas as either A-Zones or V- Zones. The flood prone areas on the Flood Insurance Rate Maps are generally divided into two general hazard zones:

A-Zones: Riverine flood prone areas and coastal flood prone areas subject to storm surges with velocity waves of less than three feet. New construction or substantial improvements to structures are generally required to have the top of their lowest floor elevated to or above the Base Flood Elevation.

V-Zones: Coastal high hazard area, which is the portion of the coastal flood plain subject to storm surges with velocity waves of three feet or more during the 100-year flood. The bottom of the lowest horizontal structural member of the lowest floor must be elevated on pilings or columns to or above the Base Flood Elevation. The space below the lowest floor may not be used for human habitation and must be free of obstructions or constructed with non-supporting breakaway walls, open wood latticework, or insect screening. Insect screening designed to collapse under wind and water loads less than those which would occur during a 100-year flood.

Communities should recognize that there are differences between current NFIP minimum flood plain management requirements and those of this publication. Several of the flood proofing techniques covered by this publication are not permitted by the NFIP unless a variance is issued by the community or are permitted only for some structure types or in some communities. Despite these differences, the provisions are retained herein because they do reduce flood damages and their use may by appropriate under some circumstances.

NFIP regulations require that the lowest floor of new and substantially improved residential structures by elevated to or above the base (100-year) flood elevation. However, non- residential structures may be flood proofed to that elevation provided that the structure is watertight with walls that are impermeable to floodwaters. Flood proofed basements (which also must be watertight with walls that are impermeable to floodwaters) for new residential constructions are also permitted only in a community which has been granted an exception in accordance with 44 CFR 60.6 of the NFIP regulations. Structures that do not meet these requirements are generally violations of local flood plain management regulations and can be subject to extremely high flood insurance premiums. Structures which are flood proofed in accordance with NFIP regulations must therefore meet the standards corresponding to the W-1 space classification in these flood proofing Regulations.

FEMA has undertaken an effort to incorporate flood damage resistant design standards into building codes which are adopted by either states or local communities. These generally follow one of the three national model building codes, which are:

BOCA National Building Code, Building Officials and Code Administrators (BOCA), generally adopted by eastern and midwestern states.

Standard Building Code, Southern Building Code Congress International (SBCII), generally adopted by southern states.

Uniform Building Code, International Council of Building Officials (ICBO), generally adopted by western states.

This has involved the revision of specific building criteria from the NFIP flood plain management requirements (44 CFR, Parts 59 and 60) into proposed code change language for submittal to the model building code groups. These code submittals only cover the sections of the NFIP regulations that deal directly with building standards. Other NFIP requirements such as those applicable to floodways and subdivisions and certain required administrative provisions are generally beyond the scope of most building codes and are more properly addressed in zoning ordinances, subdivision ordinances, or special purpose regulations such as sanitary codes. For this reason, the model building codes generally are not a substitute for a community adopting flood plain management regulations that meet NFIP minimum standards. Once a decision is made to allow a structure to be built in a flood plain, the model building codes can assist the community in assuring the structure is adequately protected from flood damages.